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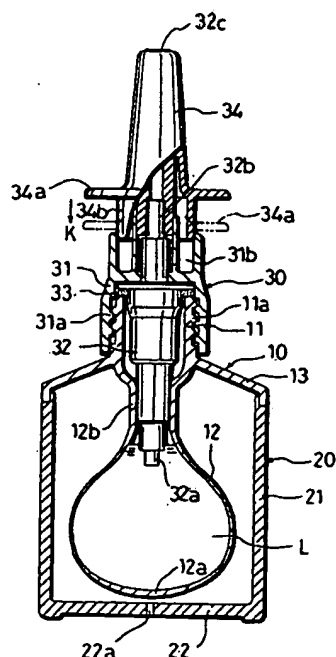
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**Liquid spray bottle.**

A liquid spray bottle preventing the contamination of a pharmaceutical liquid likely to be caused by entry of outside air and completely spraying all the pharmaceutical liquid. A main body of the spray bottle having a flexible liquid container which can be contracted according to the consumption of the liquid. An outer case covers to protect the container. A spray pump functions to draw the liquid from the container and spray out.

**Fig. 1**



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## BACKGROUND OF THE INVENTION

The present invention relates to a liquid spray bottle for spraying a pharmaceutical liquid, i.e., for nasal pits, throat or the like, and more particularly, to a liquid spray bottle preventing the contamination of the pharmaceutical liquid (hereinafter referred to simply as "liquid").

As a sprayer for applying liquid to an affected part, a liquid spray bottle has been known. Such known liquid spray bottle is generally fitted with a spray pump which has a spray nozzle at the mouth of a liquid container. When the spray pump is operated, the liquid is drawn up to the spray nozzle through a suction pipe which is inserted within the liquid container, and is sprayed out through the spray nozzle. The spray pump employed is a very small one which can be operated by single finger.

The container of the above-described known liquid spray bottle must be open to the outside atmosphere for the purpose of drawing the outside air into the container when the spray pump is operated to spray out the liquid. In this case, however, there arises such a problem that various kind of bacteria floating in the outside air is inevitably carried into the container, which cause the contaminating of the liquid. Provided that the container is fully sealed not to allow the entrance of the outside air into the container, no atmospheric pressure will be applied to the liquid, with the result that the liquid will not be drawn into the spray pump even if the spray pump is operated.

Furthermore, since the liquid in the container is drawn into the spray pump through the suction pipe, it is difficult to draw all the liquid completely. The liquid remaining in the container, therefore, goes to waste. Particularly most recent collunaria is expensive since it contains medicinally active ingredient in high concentration, therefore it is quite uneconomical that the remaining much liquid is dumped as unused.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a liquid spray bottle which can prevent the liquid in the container from contaminating by various kind of bacteria floating in the outside air and minimize the amount of liquid being remained in the container.

To achieve above described object, the present invention provides a liquid spray bottle comprising: a main body having, in the lower part, a container made of flexible material for holding a liquid, an outer case connected to the main body for covering the container, and a spray pump mounted on the main body, the container being hermetically closed by mounting the spray pump, and the outer

case being provided with an airway.

The container may be prepared as a bag-like one that is integrally or unintegrally formed with the main body, in the latter case the container can be airtightly installed to the main body through a connecting adapter.

Furthermore, the container may be prepared as a bellows type one that is integrally or unintegrally molded with the main body.

According to such a constitution as described above, the main body can be hermetically closed by mounting the spray pump after the container located in the lower part is filled up with the liquid; therefore the liquid can be kept fully off the outside air. The outer case serves to protect the container from accidental compression, through the airway provided in this outer case flows the outside air, thereby enabling constantly applying the atmospheric pressure to the outside surface of the container. The liquid in the container can be sprayed by operating the spray pump. At this time, since the flexible container shrinks as the liquid is fed out, almost all the liquid can be effectively used.

When the container to be employed is a bag-like one or a bellows type one molded integrally with the main body, there is no connecting part except the connecting part between the main body and the spray pump, and therefore, the container can readily be hermetically closed simply by mounting the spray pump.

Also, when the container to be employed is a bag-like one or a bellows type one separate from the main body, the shape of the main body comes to simple, thus can be molded with ease. Furthermore, when the connecting adapter is used for connecting the container and the main body after the connecting adapter and the container are assembled in one body, the assembly of the whole body of the liquid spray bottle further becomes facilitated.

The above and other objects, features and advantages of the present invention will become apparent from the following description read in conjunction with the accompanying drawings, in which like reference numerals designate the same elements.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing the constitution of a liquid spray bottle embodying the present invention;

Fig. 2 is a sectional view showing the constitution of another embodiment according to the present invention;

Fig. 3 is a cross sectional view taken on line X-X in Fig. 2;

Fig. 4 is a view corresponding to Fig. 2 showing another mounting construction of a container;

Fig. 5 is a sectional view of a major portion showing further another embodiment of the present invention;

Fig. 6 is a view corresponding to Fig. 5 showing another mounting construction of the container; and

Fig. 7 is an explanatory view showing a spray pump of the embodiment according to the present invention mounted with a hood.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Fig. 1 the liquid spray bottle includes a main body 10 having a container 12, an outer case 20 connected to the main body 10, and a spray pump 30 mounted to the main body 10.

The main body 10 has a hollow cylindrical mouth part 11 with an external thread 11a on the outside periphery, a bag-like container 12 formed in the lower part of the mouth part 11, and a short skirt-like mounting part 13 formed between the mouth part 11 and the container 12. These three parts are molded in a one body. This container 12, excepting its bottom part 12a and a throttle part 12b connected to the mouth part 11, is formed thin through its entire portion so that the container 12 will be flexible enough to be easily compressed under the atmospheric pressure.

The outer case 20 is formed in a shape of a bottomed container with a bottom part 22 provided at a cylindrical body 21, and is integrally connected to the main body 10 by fitting the top edge of the cylindrical body 21 on the bottom edge of the main body 10. The main body 10 and the outer case 20 may be attached in a integral structure by ultrasonic bonding. Formed in the bottom part 22 of the outer case 20 is an airway 22a.

The spray pump 30 has a case 31 which can be mounted by a thread on the mouth part 11 of the main body 10, housed in this case 31 is a pump body 32.

The case 31 is provided with an internal thread on the inner surface. Screwing the external thread 11a of the mouth part 11 into the internal thread 31a through a packing 33 can connect the case 31 airtightly to the main body 10, thereby the container 12 is hermetically sealed. At this time the lower part of the pump body 32 should be located so as come to at the throttle part 12b of the container 12. The pump body 32 thus inserted into the container 12 has a short suction pipe 32a at the bottom end of the pump body 32.

At the top of the pump body 32 is protruding a piston rod 32b, which is connected to an operating part 34 having a collar 34a around the bottom end.

The piston rod 32b can move up and down according to the vertical movement of the operating part 34. The operating part 34 has a cylindrical part 34b formed under the collar 34a. The cylindrical part 34b can be pushed along the inner wall of the guide cylinder 31b which is formed on the upper part of the case 31. Through in the piston rod 32b is formed, in the axial direction, a pharmaceutical liquid injection passage not illustrated. At the top of the piston rod 32b is installed a spray tip 32c, which opens at the top of the operating parts 34. In the pump body 32 is installed a check valve which allow the flow of the liquid L only in the opposite direction of the direction of the arrow K, and a spring for pressing the operating part 34 in the opposite direction of the direction of the arrow K.

The pump body 32 is of such a mechanism that, with the collar 34a of the operating part 34 and the bottom section 22 of the outer case 20 held by fingers, the piston rod 32b is pushed downward in the direction of the arrow K in Fig. 1, and then is returned by the spring to a state shown in Fig. 1, drawing the liquid L out of the container 12 through the suction pipe 32a by the operation of the check valve. Further the piston rod 32b is pushed downward in the direction of the arrow K in Fig. 1, the liquid L thus drawn out can be sprayed out from the spray tip 32c at the top of the operating part 34. The operating part 34 can be pushed downward until the bottom end of the cylindrical part 34b contacts the bottom of the guide cylinder 31b of the case 31 (indicated by an alternate long and two short dashes line in Fig. 1).

With repeated operation of the operating section 34 as described above, the liquid L in the container 12 is gradually consumed, that is, the remaining amount of the liquid L decreases. As the container 12 is compressed under the atmospheric pressure, the surface level of the liquid L can be always held sufficiently high until the container 12 is finally almost fully compressed, leaving very little amount of the liquid L. In this manner it is possible to use up all the liquid L. At this time, because the check valves are built in the pump body 32, the outside air will not enter the container 12 through the pump body 32.

Furthermore, the airway 22a serves to introduce the outside air into inside of the outer case 20 (a cell defined between the outer wall of the container 12 and the inner wall of the outer case 20) for compressing the container 12 under the atmospheric pressure. Therefore, the location of the airway 22a is not limited only to the bottom 22 of the outer case 20, but may be any optional place inclusive of the main body 10. Also, the size and shape of the airway 22a may be determined as desired.

### Another Embodiment

The container 12 may be a flat flexible bag molded separately from the main body 10 as shown in Figs. 2 and 3.

The neck part 14 of the main body 10 is formed continuedly under the mouth section 11. The container 12 is installed airtightly to the neck section 14 by heat sealing. Since the flat flexible bag-like container 12 can be compressed almost flat, it is possible to further decrease the remaining amount of liquid.

Furthermore, as shown in Fig. 4, the bag-like container 12 is also attachable to the neck part 14 of the main body 10 through the connecting adapter 15. On the outside surface of the neck part 14 is formed an annular engaging bead 14a for fixedly positioning the connecting adapter fitted thereon. The connecting adapter 15 is installed airtightly to the neck part 14 after assembling integrally with the container 12 by a heat sealing. For connection between the neck section 14 and the connecting adapter 15, a suitable adhesive may be used together as the need arises.

Furthermore, as shown in Fig. 5, the container 12 may be a bellows formed integrally with the main body 10 in place of the bag-like container.

The container 12 thus constituted of the bellows contracts according to the consumption of the liquid such that the bottom 12a approaches the throttle part 12b above, thus easily enabling the use of almost all the liquid in the container.

In the main body 10 shown in Fig. 5 the neck part 14 is continuedly formed under the mouth part 11; and the throttle part 12b and the container 12 are formed also continuedly with the neck part 14. Furthermore the main body 10 has a reinforcing ribs 13a, 13a disposed between the neck part 14 and the skirt-like mounting part 13; and also an annular collar 13b for positioning the main body 10 is formed on the outer wall of the mounting part 13 in the axial intermediate position. Furthermore, on the bottom outer wall also, an annular bead 13c is formed. This bead 13c is designed to be engaged in an engaging groove 21a formed in the upper inner surface of the cylindrical body 21 of the outer case 20 when the mounting part 13 is inserted into the cylindrical body 21. At this time as the annular collar 13b contacts the top edge of the outer case 20, the insertion depth of the mounting part 13 will be restricted. The outside diameter of the annular collar 13b agrees with that of the outer case 20. A desirable number of the reinforcing ribs 13a, 13a can be formed radially around the neck part 14.

Furthermore, as shown in Fig. 6, the container 12 consist of the bellows may be separate from the main body 10. That is, the container 12 may be installed airtightly at the bottom of the neck part 14

of the main body 10 through the engaging bead 14a. The throttle part 12b in this case is formed on the neck part 14 side.

In each of the above-described embodiments, as shown in Fig. 7, the spray pump 30 can be covered with a removable hood 40. Forming an annular bead 13d on the upper end portion of the mounting part 13 of the main body 10 in Fig. 5, forming an annular engaging groove 40a on the inner surface of the lower end portion of the hood 40, and engaging the bead 13d with the engaging groove 40a, thereby it is possible to removably mount the hood 40 to the main body 10. The attaching and detaching of the hood 40 is similarly applicable to other embodiments.

In the above explanation, the outer case 20 serves to protect the container 12, therefore the shape of the outer case 20 may be any desirable one other than a bottomed cylindrical shape as far as it can hold the expanded container 12 which is full of a specific amount of the liquid L.

Furthermore, generally a short one sufficed for suction pipe 32a to be inserted into the container 12, because the spray pump 30 discharges air out from the container as it is operated repetitively to thereby enable compressing the container 12 to sufficiently raise the surface level of the pharmaceutical liquid L. The suction pipe 32a may be formed integrally with the pump body 32.

As is apparent from foregoing description, since the container holding the pharmaceutical liquid being composed of a flexible member and hermetically sealed, the container can be compressed with the atmospheric pressure according to the consumption of the liquid. Therefore, there will never occur such a case that the outside air enters the container to contaminate the liquid. Moreover, the present invention make it possible to effectively use up the liquid in the container until the remaining liquid is extremely little.

A liquid spray bottle preventing the contamination of a pharmaceutical liquid likely to be caused by entry of outside air and completely spraying all the pharmaceutical liquid. A main body of the spray bottle having a flexible liquid container which can be contracted according to the consumption of the liquid. An outer case covers to protect the container. A spray pump functions to draw the liquid from the container and spray out.

### Claims

1. A liquid spray bottle comprising: a main body having, in a lower part, a container made of flexible material for holding a pharmaceutical liquid; an outer case connected to said main body for covering said container; and a spray pump mounted to said main body; said con-

tainer being hermetically closed by mounting said spray pump and said outer case being provided with an air intake.

2. A liquid spray bottle according to claim 1, wherein said container is prepared as a bag-like one that is integrally molded with said main body. 5
3. A liquid spray bottle according to claim 1, wherein said container is prepared as a bag-like one that is separate from said main body and is mounted airtightly to the main body. 10
4. A liquid spray bottle according to claim 3, wherein said container is mounted airtightly to said main body through a connecting adapter. 15
5. A liquid spray bottle according to claim 1, wherein said container is prepared as a bellows type one that is integrally molded with said main body. 20
6. A liquid spray bottle according to claim 1, wherein said container is prepared as a bellows type one that is separate from said main body and is mounted airtightly to the main body. 25

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Fig. 1

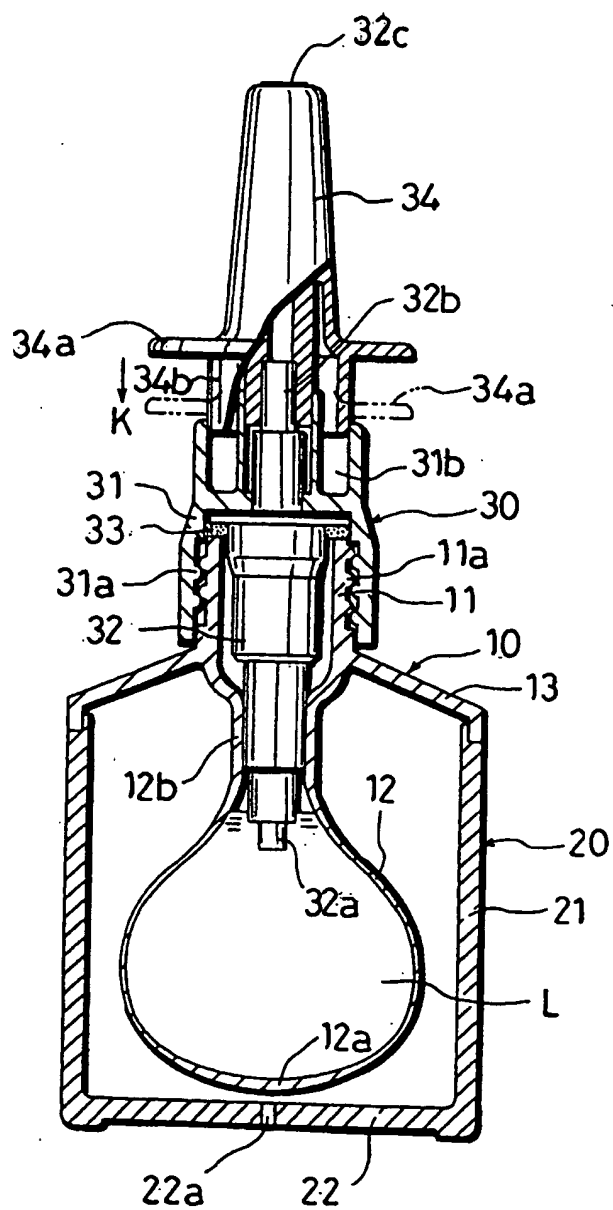


Fig. 2

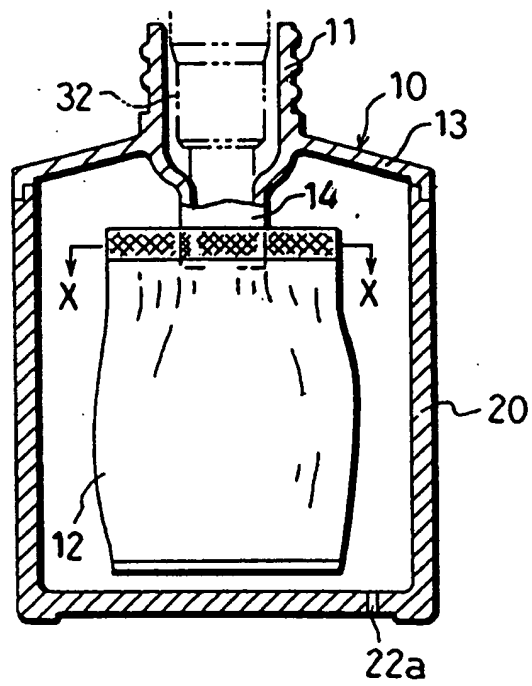


Fig. 3

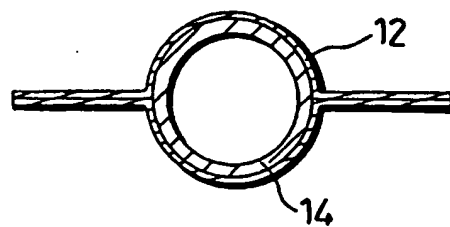


Fig. 4

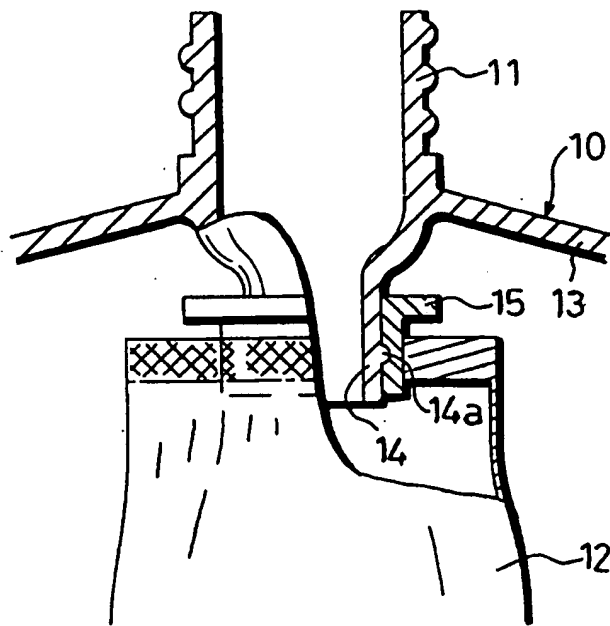




Fig. 5

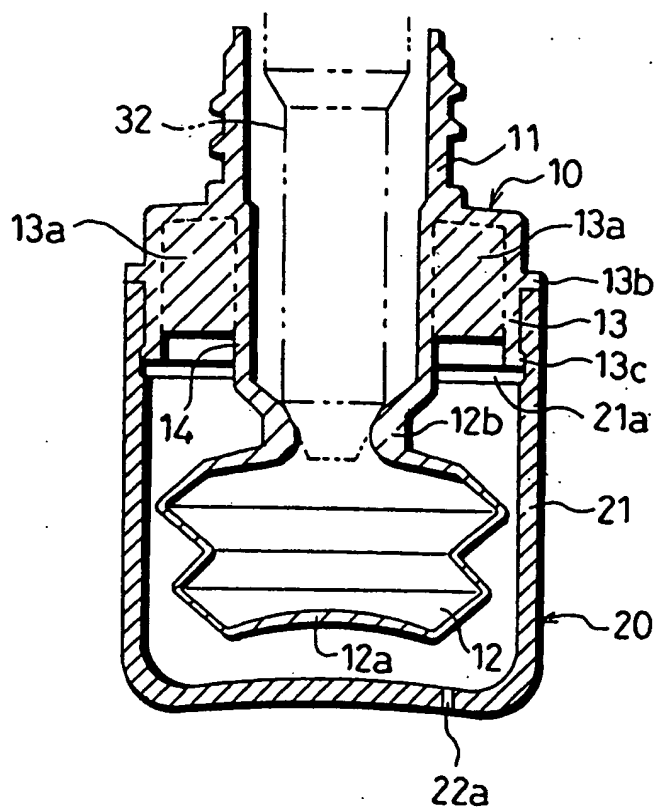
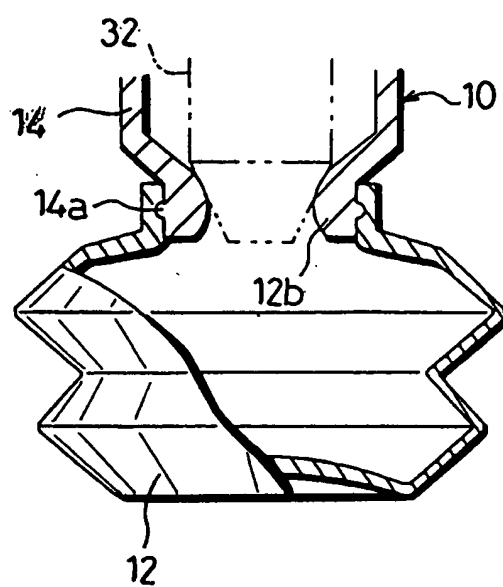


Fig. 6



**Fig. 7**

